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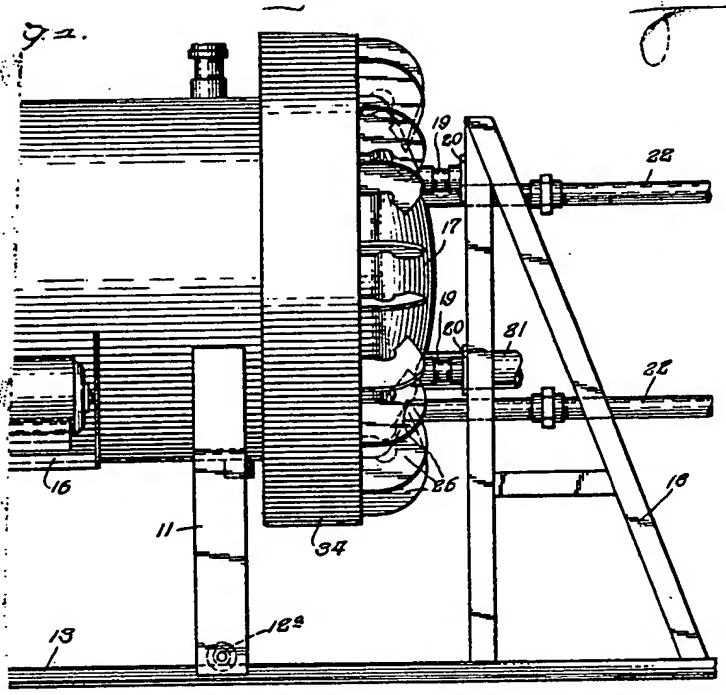


Fig. 2.

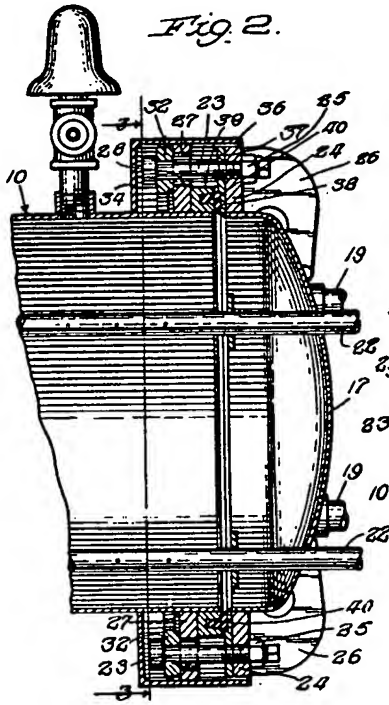


Fig. 4.

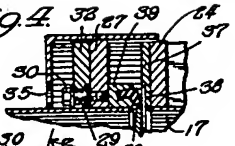
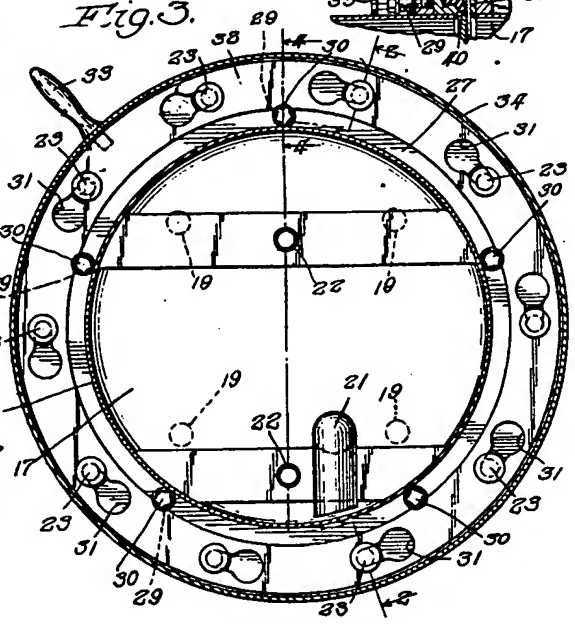


Fig. 3.



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COMMONWEALTH OF AUSTRALIA.

PATENT SPECIFICATION

Complete Specification Lodged ..... 28th May, 1954.

Application Lodged No. 565/54 ..... 28th May, 1954.

Applicant ..... Sparkler Mfg. Co.

Actual Inventors ..... Aloysius C. Kracklauer and Edward Gresens.

Convention Application.
(United States of America, 25th May, 1954).

Complete Specification Published ..... 2nd December, 1954.

Complete Specification Accepted ..... 5th July, 1956.

Classification 57.7.

Drawing attached.

COMPLETE SPECIFICATION.

"IMPROVEMENTS IN OR RELATING TO A TANK ASSEMBLY".

The following statement is a full description of this invention, including the best method of performing it known to us:-

This invention relates to a tank assembly, and more particularly to a quick opening cover for a pressure tank.

The present invention provides a tank assembly comprising: an open ended tank adapted to contain fluid under pressure; a cover plate for the open end of the tank; sealing means adapted to form a fluid tight seal between the cover plate and the open end of the tank when the cover plate is in closed position; a plurality of fastening members spaced about the periphery of the cover plate and extending in a direction axially of the tank and being adjustable in an axial direction; and cooperating complementary fastening means equal in number to said fastening members and spaced about the mouth of the tank and rotatable about the axis of the tank and operable in unison in response to a single locking rotary movement thereof when the cover plate is in closed position to engage all the said fastening members simultaneously and thereby secure the cover plate to the tank at a plurality of points, said complementary means being also operable upon reverse

rotary movement to become dis-engaged from all said fastening members simultaneously.

The invention is especially useful on tanks in which gases or liquids are placed under pressure for processing or treating, or are confined under pressure for storage or transportation. However, it may also be used on tanks for which a simple fluid tight seal is required. It may even be used on tanks which are operated or maintained in a partially evacuated condition.

One specific example of how this invention may be advantageously used is as a cover for a tank in which liquids are filtered under pressure. This invention permits rapid closing of the tank cover prior to introduction of liquid under pressure, and correspondingly rapid opening thereafter for inspection of the interior of the tank and for any cleaning or changing of filter units that may be necessary.

Tank covers used for pressure tanks normally have a number of bolts, clamps, locking levers, or similar fastening means spaced about the outer periphery of the cover. Separate manual tightening of these is of course very time consuming. It is not uncommon to find that nearly a half hour of work by the operator is required to tighten a dozen such fastening means so that they are all in balance with each other and are all reliably secure. In addition, considerable force must sometimes be applied in tightening the individual fasteners to assure a dependable closure around the entire cover.

Attempts have been made to provide for simultaneous closing of such bolts, clamps, or other fastening means. However, devices of this sort have frequently involved nothing more than application by the operator of a total force equal to the sum of the separate forces that would be required to close and tighten the individual fastening members in separate manual operations.

Sometimes the tank cover itself must be rotated in order to achieve simultaneous engagement of the several fastening means. Since covers in pressure tanks are frequently required to be of very sturdy construction, this kind of closure obviously requires exertion by the operator of a considerable amount of extra force to secure the door.

Devices for simultaneous engagement of several fastening means on a tank cover sometimes depend upon radial movement of bolts or similar means into a locked position. Such devices have a defect that is also present in the devices just mentioned which depend upon rotation of the tank cover itself for their operation. In both these kinds of devices, the type of construction often makes it impossible to adjust separately the snugness of the individual fastening means. This obviously produces an unequal distribution of the stresses which are applied to the various

fastening means by the internal tank pressure, if the alignment of each of the fastening means with the tank body is not practically perfect.

All the above disadvantages are avoided by the present invention. This tank cover may be quickly locked in position with the application of a minimum of force by the operator. Closing this tank cover on a large and heavy pressure tank having a dozen fastening bolts on the cover has been found to take only a matter of ten to twenty seconds after the cover and tank body have been moved into general proximity to each other. This compares with twenty minutes or more for conventional pressure tank covers of the same general size.

Moreover, with the tank cover of this invention there is no increase in the time consumed no matter how many fastening bolts are used. With a conventional pressure tank cover having a number of fastening members which need to be individually tightened, the time for closing the tank cover obviously increases directly as the number of fastening members is increased.

When the cover of this invention is thus quickly closed, a fluid tight seal is immediately formed. Thereafter, exertion from within of any fluid pressure at which the tank is adapted to operate acts only to make the closure more secure. Moreover, if occasional adjustments due to wear have to be made on any particular fasteners to equalize the pressure on the various fasteners on the cover, such adjustments may be made very quickly and easily before the maximum fluid pressure is exerted on the cover from within the tank.

The tank cover of this invention may likewise be quickly and easily unlocked for removal from the tank.

This invention is an improvement upon the invention covered by the copending Australian application for Letters Patent No. 563/54 entitled "Quick Opening Tank Cover".

The invention will be described in relation to the embodiment shown in the accompanying drawings, in which:

Figure 1 is a side elevation of a pressure filtering tank;

Figure 2 is a fragmentary sectional view taken along line 2-2 of Figure 3;

Figure 3 is a sectional view taken along line 3-3 of Figure 2; and

Figure 4 is a fragmentary sectional view taken along line 4-4 of Figure 3.

Movable tank. Figure 1 shows a pressure filtering tank 10 of sturdy construction which is mounted on legs 11. The four legs all terminate in grooved wheels, wheels 12 and 12a being seen in Figure 1. The grooved wheels ride upon suitable tracks 13 to make the tank movable forward and backward.

The tank is moved along tracks 13 by electric motor 14.

The motor is coupled to gear reductor 15, which in turn is coupled to drive wheel 12 through an arrangement of sprockets and chains. The arrangement of sprockets and chains provides additional reduction in the gear ratio between motor 14 and drive wheel 12. Electric motor 14 and gear reductor 15 are mounted on platform 16, which is suitably attached to the side of the tank.

The forward and rearward motion of tank 10 along tracks 13 is controlled by a set of push buttons (not shown) which is placed for convenient use by the operator who is running the filter operation.

Stationary cover. Cover plate 17 for pressure tank 10 occupies a stationary position in a vertical plane perpendicular to the longitudinal axis of the tank. It is strongly braced by A-frames 18 and horizontal members 19.

The cover plate can be put in its optimum position in relation to the tank body by adjustment of threaded members 19 with respect to flanges 20, and by variation of the horizontal and vertical position of the flanges themselves. The flanges are bolted to their respective A-frames, and the bolt holes are made large enough to permit adjustment in the position of the flanges on the A-frames.

A suitable inlet pipe 21, seen in Figures 1 and 3, is provided for introduction through the tank cover and into the tank of liquid to be filtered. Suitable outlet pipes 22 are also arranged to pass through tank cover 17 into the interior of the tank, where they serve both as a means of supporting chambered filter units vertically positioned within the tank and to receive clear filtrate from the filter units after it has passed through the filtering medium.

Fasteners. As seen in Figure 2, a plurality of fasteners 23 are spaced about the outside of the cover plate. In the embodiment shown, as will be seen especially from Figure 3, there are ten such fasteners.

The fasteners are supported by and threaded into ring 24 which is welded to the edge of cover plate 17. The fasteners shown are bolts, with the heads of the bolts overlapping for a distance beyond the mouth of the tank. The opposite end of each bolt is square, so that the position of the bolt head with respect to ring 24 may be easily varied by rotation of the bolt. Nut 25 is tightened up on the threaded portion of the bolt until it is snug against ring 24, thus holding bolt 23 in the desired position.

It is seen from Figures 1 and 2 that ring 24 is braced by a large number of knee braces 26.

Complementary fastening means. Ring 27, welded to the tank body, carries complementary fastening means which are adapted to engage the bolt heads of fasteners 23 and confine them

against any movement axially of the tank body. Ring 27 has ten apertures 28 spaced directly opposite the ten fasteners which are attached to the cover plate.

Ring 27 carries a plurality of rollers 29, seen in Figures 3 and 4. The rollers are bolted to ring 27 by bolts 30.

Complementary fastening means 31 are, in the embodiment shown, keyhole shaped slots in ring 32. Ring 32 is rotatably mounted on rollers 29. Handle 33 is attached thereto, positioned for convenient movement by the operator of the filter apparatus.

Operation of complementary fastening means. The large end of slot 31 is of sufficient diameter to receive the bolt head of fastener 23. The small end of the slot, however, is narrow enough that the bolt head is confined against any but very slight movement along the tank body axis when ring 32 is rotated in a counterclockwise direction in Figure 3.

It is seen from Figures 2 and 3 that as the movable tank body is brought up into the closed position against cover plate 17, the bolt heads of fastener 23 will pass through apertures 28 in ring 27 and -- if ring 32 is in the proper position -- through the large end of complementary fastening means 31 until the bolt head extends beyond the far side of ring 32. At this point, rotation of ring 32 through a very small angular distance will immediately lock all ten fasteners 23 to the tank body, with but a very slight amount of slack in the engagement between the fasteners and the tank body.

Ring shroud. Rings 27 and 32 are enclosed, as shown in Figures 1 and 2, by shroud 34, which is welded to the tank body and also to the outer edge of ring 27. As seen in Figure 4, shroud 34 has apertures 35 spaced opposite rollers 29 for easy access to the rollers and associated bolts if any necessity arises for changing or adjusting the rollers.

Lip 36 of shroud 34 extends beyond ring 27 to overlap a short distance beyond the edge of cover plate 17 and its associated structure. If there is any failure in the seal maintained in this pressure filter tank, it is seen that lip 36 will protect the surrounding area against liquid being sprayed out of the tank by the hydraulic pressure within the vessel.

Fluid tight seal. As seen in Figures 2 and 4, ring 24 carries a metal bearing plate 37. This bearing is notched at its inner periphery 38.

The opposing ring 27 and tank body 10 have attached thereto a slotted ring 39 which has secured in it gasket ring 40. The gasket ring is positioned to fit into notch 38 around the entire circumference of bearing 37 when cover plate 17 and tank body 10 are in their closed position.

In the embodiment shown in Figure 1, as tank 10 is moved

along tracks 13 into position for closing of the tank cover, bearing ring 37 approaches ring 39 and rubber gasket 40. As this happens, the elements will occupy the position shown in Figure 4.

As is seen from that figure, gasket 40 is so positioned that the inner edge of the gasket is normally biased closer than the rest of the gasket to the rim of the cover plate as the tank body and cover plate are brought into closed position. As the tank body moves nearer to the cover plate until it is finally in its closed position, rubber gasket 40 is pressed, as shown in Figure 2, between rings 37 and 39. The "feathering" of gasket ring 40 described above, with the inner edge of the gasket ring pressed tightly against notch 38 of bearing ring 37, improves the reliability of the seal thus formed. (In fact, within limits any increase in the pressure in the tank will actually tend to improve the seal formed by gasket 40, by pressing the inside edge of the gasket against the rim of the cover plate).

The fluid tight seal thus formed between rings 37 and 39 will be adequate for many purposes. It is seen, however, that if internal pressure slides the tank body to the left in Figures 2 and 4 away from the rim of the cover plate more than a very slight distance, the seal will be broken.

Pressure tight seal. It is the engagement of fasteners 23 and complementary fastening means 31 that prevents the tank body from moving far enough to break the seal. In fact, so long as the seal between gasket 40 and plate 36 remains fluid tight, any increase in internal pressure only tightens fasteners 23 more securely against the complementary fastening means.

To release this pressure tight seal and open the tank, the hydraulic pressure within the tank is first removed. The tank body is then driven forward toward the cover plate by means of motor 14. This again creates a slight play or slack between fasteners 23 and complementary fastening means 31. The latter may be quickly rotated by handle 33 to release the tank body. The body may then be immediately moved back from the cover plate by motor 14 to expose the filter plates within the tank.

The entire operation of releasing the pressure tight seal and opening the tank can be completed, with this invention, in only a few seconds more than the closing operation required. Thus the opening time comes to no more than a half minute or so with this quick opening tank cover.

The above detailed description has been given for clearness of understanding only. No unnecessary limitations should be understood therefrom, as modifications will be obvious to those skilled in the art.

The claims defining the invention are as follows:-

1. A tank assembly comprising: an open ended tank

adapted to contain fluid under pressure; a cover plate for the open end of the tank; sealing means adapted to form a fluid tight seal between the cover plate and the open end of the tank when the cover plate is in closed position; a plurality of fastening members spaced about the periphery of the cover plate and extending in a direction axially of the tank and being adjustable in an axial direction; and cooperating complementary fastening means equal in number to said fastening members and spaced about the mouth of the tank and rotatable about the axis of the tank and operable in unison in response to a single locking rotary movement thereof when the cover plate is in closed position to engage all the said fastening members simultaneously and thereby secure the cover plate to the tank at a plurality of points, said complementary means being also operable upon reverse rotary movement to become dis-engaged from all said fastening members simultaneously. (25th May, 1954).

2. The tank assembly of claim 1 in which said fastening members are adapted to extend over the mouth of the tank and said complementary fastening means are rotatably attached to the outside of the tank, said complementary means being adapted to become simultaneously engaged with said fastening members, when the cover plate is in its closed position, upon rotation in one direction, and to become disengaged simultaneously upon rotation in the opposite direction. (25th May, 1954).

3. The tank assembly of claim 2 in which said fastening members include bolts attached about the periphery of the cover plate and said complementary fastening means include a ring rotatably attached to the outside of the tank, said ring having a slot opposite each of said bolts, said slot having one end wide enough to permit insertion of the head of the bolt and another end narrow enough to confine the bolt head against removal from the slot. (25th May, 1954).

4. The tank assembly of claim 1 in which the sealing means includes a gasket adapted to be pressed yieldable between the cover plate and the rim of the tank mouth. (25th May, 1954).

5. The tank assembly of claim 4 in which the edge of the gasket facing the inside of the tank is normally biased in a position closer than the rest of the gasket to the rim of the cover plate as the latter approaches its closed position. (25th May, 1954).

6. A tank assembly as defined in claim 1 adapted to

contain fluids under pressure in which the sealing means is operative to form a seal that is proof against any fluid pressure at which the tank is adapted to operate; and in which the slack in the engagement between the fastening members and the complementary fastening means is sufficiently small to maintain the sealing means in operative condition when fluid pressure is exerted against the cover plate from within the tank. (25th May, 1954).

7. A tank assembly constructed substantially as herein described with reference to the accompanying drawings. (25th May, 1954).

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